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<110> E.I. du Pont de Nemours

<120> Polynucleotides Encoding Aminolevulinic Acid Biosynthetic Enzymes

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<151> 1999-07-30

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<211> 312

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<213> Zea mays

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Val Ile Gly Leu Ser Val His Thr Ala Pro Val Glu Met Xaa Xaa Lys
 35 40 45

Leu Ala Val Ala Glu Glu Leu Trp Pro Arg Ala Ile Gln Glu Leu
 50 55 60

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 <213> Zea mays

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<213> Zea mays

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35 40 45

Val Glu Ala Gln Ala Gln Ala Val Ala Lys Ala Ala Ser Val Ala Ala
50 55 60

Leu Glu Gln Phe Lys Ile Ser Ala Asp Arg Tyr Met Lys Glu Arg Ser
65 70 75 80

Thr Ile Ala Val Ile Gly Leu Ser Val His Thr Ala Pro Val Glu Met
85 90 95

Arg Glu Lys Leu Ala Val Ala Glu Glu Leu Trp Pro Arg Ala Ile Gln
100 105 110

Glu Leu Thr Ser Leu Asn His Ile Glu Glu Ala Ala Val Leu Ser Thr
115 120 125

Cys Asn Arg Met Glu Ile Tyr Val Val Ala Leu Ser Trp Asn Arg Gly
130 135 140

Ile Arg Glu Val Val Asp Trp Met Ser Lys Lys Ser Gly Ile Pro Ala
145 150 155 160

Ser Glu Leu Arg Glu His Leu Phe Ile Leu Arg Ser Ser Asp Ala Thr
165 170 175

Arg His Leu Phe Glu Val Ser Ala Gly Leu Asp Ser Leu Val Leu Gly
180 185 190

Glu Gly Gln Ile Leu Ala Gln Val Lys Gln Val Val Arg Ser Gly Gln
195 200 205

Asn Ser Gly Gly Leu Gly Lys Asn Ile Asp Arg Met Phe Lys Asp Ala
210 215 220

Ile Thr Ala Gly Lys Arg Val Arg Ser Glu Thr Asn Ile Ser Ser Gly
225 230 235 240

Ala Val Ser Val Ser Ser Ala Ala Val Glu Leu Ala Leu Met Lys Leu
245 250 255

Pro Lys Ser Glu Ala Leu Ser Ala Arg Met Leu Leu Ile Gly Ala Gly
260 265 270

Lys Met Gly Lys Leu Val Ile Lys His Leu Val Ala Lys Gly Cys Lys
 275 280 285
 Lys Val Val Val Val Asn Arg Ser Val Glu Arg Val Asp Ala Ile Arg
 290 295 300
 Glu Glu Met Lys Asp Ile Glu Ile Val Tyr Arg Pro Leu Ser Asp Met
 305 310 315 320
 Tyr Gln Ala Ala Ala Glu Ala Asp Val Val Phe Thr Ser Thr Ala Ser
 325 330 335
 Glu Thr Ser Leu Phe Ala Lys Glu His Ala Glu Ala Leu Pro Pro Val
 340 345 350
 Ser Asp Thr Met Gly Gly Val Arg Leu Phe Val Asp Ile Ser Val Pro
 355 360 365
 Arg Asn Val Ser Ala Cys Val Ser Glu Val Gly Ala Ala Arg Val Tyr
 370 375 380
 Asn Val Asp Asp Leu Lys Glu Val Val Glu Ala Asn Lys Glu Asp Arg
 385 390 395 400
 Leu Arg Lys Ala Met Glu Ala Gln Thr Ile Ile Thr Glu Glu Leu Arg
 405 410 415
 Arg Phe Glu Ala Trp Arg Asp Ser Leu Glu Thr Val Pro Thr Ile Lys
 420 425 430
 Lys Leu Arg Ser Tyr Ala Asp Arg Ile Arg Ala Ser Glu Leu Glu Lys
 435 440 445
 Cys Leu Gln Lys Val Gly Glu Asp Ala Leu Thr Lys Lys Met Arg Arg
 450 455 460
 Ala Ile Glu Glu Leu Ser Thr Gly Ile Val Asn Lys Leu Leu His Gly
 465 470 475 480
 Pro Leu Gln His Leu Arg Cys Asp Gly Ser Asp Ser Arg Thr Leu Asp
 485 490 495
 Glu Thr Leu Glu Asn Met His Ala Leu Asn Arg Met Phe Ser Leu Asp
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 Thr Gln Asn
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 <213> Oryza sativa

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 <213> Oryza sativa

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 Val Ile Gly Leu Ser Val His Thr Ala Pro Val Glu Met Arg Glu Lys
 35 40 45

Leu Ala Val Ala Glu Glu Leu Trp Pro Arg Ala Ile Ser Glu Leu Thr
 50 55 60

Ser Leu Asn His Ile Glu Glu Val Ala Val Leu Xaa Leu Ser Thr Cys
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Asn Arg Met Glu Ile Tyr Val
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<211> 1778

<212> DNA

<213> *Oryza sativa*

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<212> PRT

<213> *Oryza sativa*

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Phe Lys Ile Ser Ala Asp Arg Tyr Met Lys Glu Arg Ser Ser Ile Ala
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355 360 365

Ala Trp Arg Asp Ser Leu Glu Thr Val Pro Thr Ile Lys Lys Leu Arg
370 375 380

Ser Tyr Ala Asp Arg Ile Arg Ala Ser Glu Leu Glu Lys Cys Leu Gln
385 390 395 400

Lys Ile Gly Glu Asp Ala Leu Thr Lys Lys Met Arg Arg Ser Ile Glu
405 410 415

Glu Leu Ser Thr Gly Ile Val Asn Lys Leu Leu His Gly Pro Leu Gln
420 425 430

His Leu Arg Cys Asp Gly Ser Asp Ser Arg Thr Leu Asp Glu Thr Leu
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Glu Asn Met His Ala Leu Asn Arg Met Phe Ser Leu Asp Thr Glu Lys
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Ala Ile Ile Glu Gln Lys Ile Lys Ala Lys Val Glu Lys Ser Gln Asn
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<211> 25

<212> PRT

<213> Glycine max

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Leu Lys Cys Ser Ser Ser Ser Ser Ser
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<210> 11

<211> 2055

<212> DNA

<213> Glycine max

<400> 11

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caaccacttt ctccggtgcc aaattggagg ctctattgct caaatgttct tcctcctctt 180
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gtagtctgaa tcatattgaa gaagcagctg ttctgagtac ctgcaatcga atggagatat 540

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<210> 12
<211> 536
<212> PRT
<213> Glycine max

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<400> 12
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Leu Lys Cys Ser Ser Ser Ser Ser Ser Pro Pro Pro Ser Arg Ser Ser
          20             25             30

Phe Thr Thr Phe Pro Gly Gln Asn Arg Arg Thr Leu Ile Gln Arg Gly
 35             40             45

Val Ile Arg Cys Asp Ala Gln Pro Ser Asp Ala Ser Ser Val Ala Pro
 50             55             60

Asn Asn Ala Thr Ala Leu Ser Ala Leu Glu Gln Leu Lys Thr Ser Ala
 65             70             75             80

Ala Asp Arg Tyr Thr Lys Glu Arg Ser Ser Ile Ile Ala Ile Gly Leu
          85             90             95

Ser Val His Thr Ala Pro Val Glu Met Arg Glu Lys Leu Ala Ile Pro
          100            105            110

Glu Ala Glu Trp Pro Arg Ala Ile Ala Glu Leu Cys Ser Leu Asn His
          115            120            125

Ile Glu Glu Ala Ala Val Leu Ser Thr Cys Asn Arg Met Glu Ile Tyr
          130            135            140

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Val Leu Ala Leu Ser Gln His Arg Gly Val Lys Glu Val Met Glu Trp
 145 150 155 160
 Met Ser Lys Thr Ser Ser Val Pro Val Ser Glu Leu Ser Gln His Arg
 165 170 175
 Phe Leu Leu Tyr Asn Asn Asp Ala Thr Gln His Leu Phe Glu Val Ser
 180 185 190
 Ala Gly Leu Asp Ser Leu Val Leu Gly Glu Gly Gln Ile Leu Ser Gln
 195 200 205
 Val Lys Gln Val Val Lys Val Gly Gln Gly Val Asn Gly Phe Gly Arg
 210 215 220
 Asn Ile Ser Gly Leu Phe Lys His Ala Ile Thr Val Gly Lys Arg Val
 225 230 235 240
 Arg Thr Glu Thr Asn Ile Ala Ser Gly Ala Val Ser Val Ser Ser Ala
 245 250 255
 Ala Val Glu Leu Ala Tyr Met Lys Leu Pro Glu Ala Ser His Asp Asn
 260 265 270
 Ala Arg Met Leu Val Ile Gly Ala Gly Lys Met Gly Lys Leu Val Ile
 275 280 285
 Lys His Leu Val Ala Lys Gly Cys Lys Lys Met Val Val Val Asn Arg
 290 295 300
 Thr Glu Glu Arg Val Ala Ala Ile Arg Glu Glu Leu Lys Asp Ile Glu
 305 310 315 320
 Ile Ile Tyr Lys Pro Leu Ser Glu Met Leu Thr Cys Ala Gly Glu Ala
 325 330 335
 Asp Leu Val Phe Thr Ser Thr Ala Ser Glu Asn Pro Leu Phe Leu Lys
 340 345 350
 Glu His Val Lys Asp Leu Pro Pro Ala Ser Gln Glu Val Gly Gly Arg
 355 360 365
 Arg Phe Phe Ile Asp Ile Ser Val Pro Arg Asn Val Gly Ser Cys Val
 370 375 380
 Ser Asp Leu Glu Ser Val Arg Val Tyr Asn Val Asp Asp Leu Lys Glu
 385 390 395 400
 Val Val Ala Ala Asn Lys Glu Asp Arg Leu Arg Lys Ala Met Glu Ala
 405 410 415
 Gln Ala Ile Ile Ala Glu Glu Ser Lys Gln Phe Glu Ala Trp Arg Asp
 420 425 430
 Ser Leu Glu Thr Val Pro Thr Ile Lys Lys Leu Arg Ala Tyr Ala Glu
 435 440 445
 Arg Ile Arg Leu Ala Glu Leu Glu Lys Cys Leu Gly Lys Met Gly Asp
 450 455 460

Asp Ile Pro Lys Lys Thr Arg Arg Ala Val Asp Asp Leu Ser Arg Gly
465 470 475 480

Ile Val Asn Lys Lys Leu His Gly Pro Met Gln His Leu Arg Cys Asp
485 490 495

Gly Asn Asp Ser Arg Thr Leu Ser Glu Thr Leu Glu Asn Met Asn Ala
500 505 510

Leu Asn Arg Met Phe Asn Leu Glu Thr Glu Ile Ser Val Leu Glu Glu
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Lys Ile Arg Ala Lys Val Glu Gln
530 535

<210> 13

<211> 507

<212> DNA

<213> Glycine max

<220>

<221> unsure

<222> (496)

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<221> unsure

<222> (500)

<400> 13

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acctctctct ccctcttctc ctccgcccga ttccgcccact ccctccgccc accgccttct 180
caactcttct tcccacgcgc gcgcttttcc gtcaacgccca cgtgtccctt cttctccgat 240
aacaacaatt cccttcccca aaacgtcgtc gcttccaaac cctccccctc cgagttgctc 300
aaagcttctc ccgcccacag atatacgaag gaaaagagtt gcattatttg catagggctg 360
aacattcaca ctgctcccgt tgagatgcgt gagaagcttg caattccaag aatcccattg 420
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<210> 14

<211> 46

<212> PRT

<213> Glycine max

<400> 14

Ala Ser Lys Pro Ser Pro Leu Glu Leu Leu Lys Ala Ser Ser Ala Asp
1 5 10 15

Arg Tyr Thr Lys Glu Lys Ser Cys Ile Ile Cys Ile Gly Leu Asn Ile
20 25 30

His Thr Ala Pro Val Glu Met Arg Glu Lys Leu Ala Ile Pro
35 40 45

<210> 15

<211> 1983

<212> DNA
<213> Glycine max

<400> 15
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cgccaccacc tcctcctccc tcttctcctc cgcccgattc cgccactccc tccgccacc 180
gccttctcaa ctcttcttcc cagcgcgcg cttttccgtc aacgccacgt gtcccttctt 240
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gttgctcaaa gcttcctccg ccgacagata tacgaaggaa aagagttgca ttatttgcgt 360
agggctgaac attcacactg ctcccgttga gatgcgtgag aagcttgcaa ttccagaatc 420
ccattgggct caggctatta aggacctttg cgctttgaac catatcgaag aagccgcggg 480
tctcagcacg tgtaaccgca tggagatcta tgttgggct ctttcccagc accgtggtgt 540
taaggaagtt actgattgga tgtctaagggt gagcgggatt tcaatacctg agctttgtga 600
gcaccaagtt ttgctgtata acgcggatgt cagcgagcat ctctttgaag tggcggcagg 660
gcttgactca cttgttcttg gggaagggtca aattcttgct cagggtgaagc aggttgtgaa 720
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ccttagtatg ggtattgtga ataagctact tcatggtccc atgcagcacc taaggtgtga 1560
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ggttcagaag tagattcttc ttcaattggt ttagttttat ttgattcttg tgggggctgc 1740
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caattatttt taacattatg cagaagtaat tggacatcga tagtccaatt gaattcaaca 1860
tgtatttttc tcaatgagcc tgatatagat cagttgtaaa ttcgatgcc tcatgacaac 1920
agatgattct tgttttttaa taacattaat gttagagcgg agtataaaaa aaaaaaaaaa 1980
aaa 1983

<210> 16
<211> 467
<212> PRT
<213> Glycine max

<400> 16
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Glu Lys Ser Cys Ile Ile Cys Ile Gly Leu Asn Ile His Thr Ala Pro
20 25 30
Val Glu Met Arg Glu Lys Leu Ala Ile Pro Glu Ser His Trp Ala Gln
35 40 45
Ala Ile Lys Asp Leu Cys Ala Leu Asn His Ile Glu Glu Ala Ala Val
50 55 60
Leu Ser Thr Cys Asn Arg Met Glu Ile Tyr Val Val Ala Leu Ser Gln
65 70 75 80

His Arg Gly Val Lys Glu Val Thr Asp Trp Met Ser Lys Val Ser Gly
 85 90 95
 Ile Ser Ile Pro Glu Leu Cys Glu His Gln Val Leu Leu Tyr Asn Ala
 100 105 110
 Asp Val Thr Gln His Leu Phe Glu Val Ala Ala Gly Leu Asp Ser Leu
 115 120 125
 Val Leu Gly Glu Gly Gln Ile Leu Ala Gln Val Lys Gln Val Val Lys
 130 135 140
 Ala Gly Gln Gly Val Pro Gly Phe Asp Lys Lys Ile Ser Gly Leu Phe
 145 150 155 160
 Lys Gln Ala Ile Ser Val Gly Lys Arg Val Arg Thr Glu Thr Asn Ile
 165 170 175
 Ser Ser Gly Ser Val Ser Val Ser Ser Ala Ala Val Glu Leu Ala Leu
 180 185 190
 Met Lys Leu Pro Asp Ser Ser Phe Ala Asp Ser Gly Val Leu Val Val
 195 200 205
 Gly Ala Gly Lys Met Gly Lys Leu Val Ile Lys His Leu Ala Ala Lys
 210 215 220
 Gly Cys Arg Arg Met Val Val Val Asn Arg Thr Glu Glu Lys Val Asn
 225 230 235 240
 Ala Ile Arg Lys Glu Leu Lys Asp Val Glu Ile Val Phe Arg Pro Phe
 245 250 255
 Ser Asp Met Leu Ala Cys Ala Ala Glu Ala Asp Val Ile Phe Thr Ser
 260 265 270
 Thr Ala Ser Glu Ser Pro Leu Phe Ser Lys Gln Asn Val Gln Met Leu
 275 280 285
 Pro Leu Val Asn His Gly Arg Arg Arg Leu Phe Val Asp Ile Ser Ile
 290 295 300
 Pro Arg Asn Val Glu Pro Gly Val Ser Asp Leu Glu Thr Ala Leu Val
 305 310 315 320
 Tyr Asn Val Asp Asp Leu Lys Glu Val Val Ala Ala Asn Lys Glu Asp
 325 330 335
 Arg Leu Gln Lys Ala Glu Glu Ala Arg Gly Ile Ile Leu Glu Glu Leu
 340 345 350
 Asn Lys Phe Glu Ala Trp Lys Asp Ser Leu Glu Thr Val Pro Thr Ile
 355 360 365
 Lys Lys Phe Arg Ala Tyr Val Glu Arg Ile Arg Ala Ser Glu Met Glu
 370 375 380
 Lys Cys Leu Ser Lys Met Gly Pro Asp Val Ser Lys Gln Gln Lys Asp
 385 390 395 400

Ala Ile Tyr Ala Leu Ser Met Gly Ile Val Asn Lys Leu Leu His Gly
 405 410 415

Pro Met Gln His Leu Arg Cys Asp Gly Lys Asn Asp Ser Ser Leu Ser
 420 425 430

Glu Val Leu Glu Asn Met Arg Ala Leu Asn Arg Met Tyr Asp Leu Glu
 435 440 445

Thr Glu Ile Ser Leu Ile Glu Glu Lys Ile Arg Val Lys Met Glu Arg
 450 455 460

Val Gln Lys
 465

<210> 17
 <211> 468
 <212> DNA
 <213> Glycine max

<220>
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 <222> (454) .. (455)

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 accgccttca aggtcatcat tcaccacttt tcccggccaa aacagaagaa ccctcattca 180
 gagaggggtt attcgctgcg acgctcagcc ctctgatgca tcctctgttg cnccaaataa 240
 tgccaccgct ctctccgctc ttgagcagct caagacttct gcagctgata gatatacnaa 300
 tgaaagcagc agnattaccg ccattggggg cagtgtgcaa ctgcactgng aaatccgtgn 360
 aaacttgcaa tcaggannag aatngccnga nntattnaan agtgtgngtn tgatatttaa 420
 gannnnnngt nnantactgn nategntgtg ntnnngtctg cctgtaca 468

<210> 18
 <211> 26
 <212> PRT
 <213> Glycine max

<220>
 <221> UNSURE
 <222> (8)

<220>
 <221> UNSURE
 <222> (21)

<400> 18
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Leu Leu Lys Cys Xaa Ser Ser Ser Ser Ser
 20 25

<210> 19
 <211> 1480
 <212> DNA
 <213> Triticum aestivum

<400> 19
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 cagtctgaat catatcgaag aggctgctgt tctgagtacc tgcaacagaa tggaaatata 180
 tgtggtggct ttatcgtgga accgtggtat tagagaagta gtagactgga tgtcaaagaa 240
 aagtggaaatc cctgcttccg agctgaggga gcatctcttt atgttgctg acagtgatgc 300
 cacacgccat ctggttgagg tatccgccgg gcttgactct ttggttcttg gagaaggaca 360
 aatccttgct caagttaaac aagttgtcag aaatgggcaa aacagtggag gcttgggaaa 420
 gaacattgat aggatgttca aggatgcaat cacagctgga aagcgtgtcc gctgtgaaac 480
 caacatatca gctggtgctg tgtctgtcag ttcagctgca gttgaattgg ccatgatgaa 540
 gcttccaaag tctgaatgct tgtcagctag gatgcttttg attggtgctg gcaaaatggg 600
 aaaattgggtt gtcaaacatt tgattgccaa aggatgcaag aaggttggtt tgggtgaaccg 660
 ttctgtggaa aggttggtat ccattcgcca agagatgaaa gatattgaga ttgtgtacag 720
 gcctcttaca gagatgtatg aagccgctgc tgaagctgat gtcgtgttca caagcaccgc 780
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 gaaacggttc gaggcattga gggactcaat ggagacggtt ccgaccatca aaaagctgag 1080
 gtcgtacgcc gacaggatca gggcatccga gctcgagaag tgtctgcaga agatcgggga 1140
 agacaatctc aacaagaaga tgagaaggtc catcgaggag ctgagcacgg gcatagttaa 1200
 caagctcctt cacggccac tgcagcacct gagatgacac ggcagcgaca gccgcacct 1260
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 ccaatatitit tcttttggat cctccaaaaa aaaaaaaaaa 1480

<210> 20
 <211> 454
 <212> PRT
 <213> Triticum aestivum

<400> 20
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 Val Asp Met Arg Glu Lys Leu Ala Val Ala Glu Glu Leu Trp Pro Arg
 20 25 30
 Ala Ile Ser Glu Leu Thr Ser Leu Asn His Ile Glu Glu Ala Ala Val
 35 40 45
 Leu Ser Thr Cys Asn Arg Met Glu Ile Tyr Val Val Ala Leu Ser Trp
 50 55 60
 Asn Arg Gly Ile Arg Glu Val Val Asp Trp Met Ser Lys Lys Ser Gly
 65 70 75 80
 Ile Pro Ala Ser Glu Leu Arg Glu His Leu Phe Met Leu Arg Asp Ser
 85 90 95
 Asp Ala Thr Arg His Leu Phe Glu Val Ser Ala Gly Leu Asp Ser Leu
 100 105 110

Val Leu Gly Glu Gly Gln Ile Leu Ala Gln Val Lys Gln Val Val Arg
 115 120 125
 Asn Gly Gln Asn Ser Gly Gly Leu Gly Lys Asn Ile Asp Arg Met Phe
 130 135 140
 Lys Asp Ala Ile Thr Ala Gly Lys Arg Val Arg Cys Glu Thr Asn Ile
 145 150 155 160
 Ser Ala Gly Ala Val Ser Val Ser Ser Ala Ala Val Glu Leu Ala Met
 165 170 175
 Met Lys Leu Pro Lys Ser Glu Cys Leu Ser Ala Arg Met Leu Leu Ile
 180 185 190
 Gly Ala Gly Lys Met Gly Lys Leu Val Val Lys His Leu Ile Ala Lys
 195 200 205
 Gly Cys Lys Lys Val Val Val Val Asn Arg Ser Val Glu Arg Val Asp
 210 215 220
 Ala Ile Arg Gln Glu Met Lys Asp Ile Glu Ile Val Tyr Arg Pro Leu
 225 230 235 240
 Thr Glu Met Tyr Glu Ala Ala Ala Glu Ala Asp Val Val Phe Thr Ser
 245 250 255
 Thr Ala Ser Glu Ser Leu Leu Phe Thr Lys Glu His Ala Glu Ala Leu
 260 265 270
 Pro Pro Ile Ser Leu Ala Val Gly Gly Val Arg Leu Phe Val Asp Ile
 275 280 285
 Ser Val Pro Arg Asn Val Gly Ala Cys Val Ser Glu Val Glu His Ala
 290 295 300
 Arg Val Tyr Asn Val Asp Asp Leu Lys Glu Val Val Glu Ala Asn Lys
 305 310 315 320
 Glu Asp Arg Val Arg Lys Ala Met Glu Ala Gln Thr Ile Ile Thr Gln
 325 330 335
 Glu Leu Lys Arg Phe Glu Ala Trp Arg Asp Ser Leu Glu Thr Val Pro
 340 345 350
 Thr Ile Lys Lys Leu Arg Ser Tyr Ala Asp Arg Ile Arg Ala Ser Glu
 355 360 365
 Leu Glu Lys Cys Leu Gln Lys Ile Gly Glu Asp Asn Leu Asn Lys Lys
 370 375 380
 Met Arg Arg Ser Ile Glu Glu Leu Ser Thr Gly Ile Val Asn Lys Leu
 385 390 395 400
 Leu His Gly Pro Leu Gln His Leu Arg Cys Asp Gly Ser Asp Ser Arg
 405 410 415
 Thr Leu Asp Glu Thr Leu Glu Asn Met His Ala Leu Asn Arg Met Phe
 420 425 430

Asn Leu Asp Thr Glu Lys Ala Val Leu Glu Gln Lys Ile Lys Ala Lys
 435 440 445

Val Glu Lys Thr Gln Ser
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<210> 21
 <211> 846
 <212> DNA
 <213> Zea mays

<400> 21
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 ccgccgccgt ggcgtccggg gtctcggccc ggccggccgc gccgaggagg gcttctgcgg 180
 gacgccgcgc tcggctgtcg gtggtgcggg ccgcgatata cctcgagaag ggcgagaagg 240
 cgtacacggt gcagaagtcc gaggagatct tcaacgccgc caaggagctg atgcctggag 300
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 cctgggggtcc tgcaatcatc ggccatgcag atgataaggt taatgctgca ttgattgaaa 480
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 tcgaaggctg ctaccatggc catgccgatt ccttccttgt caaagctggc agtgggtgtcg 720
 ccacccttgg cctcccagac tccctggcg tccccaaggg ggccacctac gagactctaa 780
 cggcacccta caatgatgtc gaggcagtga agaaactgtt cgaggacaac gcgggggaga 840
 ttgctg 846

<210> 22
 <211> 248
 <212> PRT
 <213> Zea mays

<400> 22
 Met Ala Gly Ala Ala Ala Ala Ala Val Ala Ser Gly Val Ser Ala
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 Ser Val Val Arg Ala Ala Ile Ser Leu Glu Lys Gly Glu Lys Ala Tyr
 35 40 45
 Thr Val Gln Lys Ser Glu Glu Ile Phe Asn Ala Ala Lys Glu Leu Met
 50 55 60
 Pro Gly Gly Val Asn Ser Pro Val Arg Ala Phe Lys Ser Val Gly Gly
 65 70 75 80
 Gln Pro Val Val Phe Asp Ser Val Lys Gly Ser Arg Met Trp Asp Val
 85 90 95
 Asp Gly Asn Glu Tyr Ile Asp Tyr Val Gly Ser Trp Gly Pro Ala Ile
 100 105 110
 Ile Gly His Ala Asp Asp Lys Val Asn Ala Ala Leu Ile Glu Thr Leu
 115 120 125

Lys Lys Gly Thr Ser Phe Gly Ala Pro Cys Leu Leu Glu Asn Val Leu
 130 135 140
 Ala Glu Met Val Ile Ser Ala Val Pro Ser Ile Glu Met Val Arg Phe
 145 150 155 160
 Val Asn Ser Gly Thr Glu Ala Cys Met Gly Ala Leu Arg Leu Val Arg
 165 170 175
 Ala Phe Thr Gly Arg Glu Lys Ile Ile Lys Phe Glu Gly Cys Tyr His
 180 185 190
 Gly His Ala Asp Ser Phe Leu Val Lys Ala Gly Ser Gly Val Ala Thr
 195 200 205
 Leu Gly Leu Pro Asp Ser Pro Gly Val Pro Lys Gly Ala Thr Tyr Glu
 210 215 220
 Thr Leu Thr Ala Pro Tyr Asn Asp Val Glu Ala Val Lys Lys Leu Phe
 225 230 235 240
 Glu Asp Asn Ala Gly Glu Ile Ala
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<210> 23
 <211> 461
 <212> DNA
 <213> *Oryza sativa*

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 ccgtcgtgcg ggcggncatc tccgtcgaga agggggagaa ggcgtacacg gtggagaagt 180
 ccgaggagat cttcaacgcc gccaaaggagt tgatgcctgn ggggtgtaat tcaccagttc 240
 gtgccttcaa atcagttggt gggcanccca ttgtgtttga ttctgtgaag ggtctcgtat 300
 gtgggatgtg gatggaaatg aatatatcga ttangttggg ntcctgangg tcntgngatn 360
 atcgggtcat gcagatgata cngtfaatgc agcatnattg aacncaaaan aaaganctnc 420
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<210> 24
 <211> 100
 <212> PRT
 <213> Oryza sativa

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 Pro Ser Pro Ser Arg Ala Arg Ala Pro Arg Ser Val Val Arg Ala Xaa
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 Ile Ser Val Glu Lys Gly Glu Lys Ala Tyr Thr Val Glu Lys Ser Glu
 35 40 45
 Glu Ile Phe Asn Ala Ala Lys Glu Leu Met Pro Xaa Gly Val Asn Ser
 50 55 60
 Pro Val Arg Ala Phe Lys Ser Val Gly Gly Xaa Pro Ile Val Phe Xaa
 65 70 75 80
 Phe Cys Glu Gly Ser Arg Met Trp Asp Val Asp Gly Asn Glu Tyr Ile
 85 90 95
 Asp Xaa Val Gly
 100

<210> 25
 <211> 1643
 <212> DNA
 <213> Oryza sativa

<400> 25
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 ccacggtccg tcgtgcgggc ggccatctcc gtcgagaagg gggagaaggc gtacacgggtg 180
 gagaagtcag aggagatctt caacgccgcc aaggagttga tgcttggggg tgtaattca 240
 ccagttcgtg ccttcaaata agttggtggg cagccattg tgtttgattc tgtgaagggt 300
 tctcgtatgt gggatgtgga tggaaatgaa tatatcgatt atgttggttc ctggggctct 360

gcgatcatcg gtcattgcaga tgatacgggtg aatgcagcat tgattgaaac tctaaagaaa 420
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 taccatggcc atgcagattc ctccctgtgt aaagctggca gtggtgttgc cacccttggc 660
 ctccagact cccctggagt cccaaggga gccacatctg agactctaac ggcaccatac 720
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 tttcatttgt gttgtacact gttagtctca catcactcaa aatctgtatt gtgcagcagc 1560
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<211> 478

<212> PRT

<213> *Oryza sativa*

<220>

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Gly Ile Ser Ala Arg Pro Val Ala Pro Arg Pro Ser Pro Ser Arg Ala
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Arg Ala Pro Arg Ser Val Val Arg Ala Ala Ile Ser Val Glu Lys Gly
35 40 45

Glu Lys Ala Tyr Thr Val Glu Lys Ser Glu Glu Ile Phe Asn Ala Ala
50 55 60

Lys Glu Leu Met Pro Gly Gly Val Asn Ser Pro Val Arg Ala Phe Lys
65 70 75 80

Ser Val Gly Gly Gln Pro Ile Val Phe Asp Ser Val Lys Gly Ser Arg
85 90 95

Met Trp Asp Val Asp Gly Asn Glu Tyr Ile Asp Tyr Val Gly Ser Trp
100 105 110

Gly Pro Ala Ile Ile Gly His Ala Asp Asp Thr Val Asn Ala Ala Leu
115 120 125

Ile Glu Thr Leu Lys Lys Gly Thr Ser Phe Gly Ala Pro Cys Val Leu
130 135 140

Glu Asn Val Leu Ala Glu Met Val Ile Ser Ala Val Pro Ser Ile Glu
 145 150 155 160
 Met Val Arg Phe Val Asn Ser Gly Thr Glu Ala Cys Met Gly Ala Leu
 165 170 175
 Arg Leu Val Arg Ala Phe Thr Gly Arg Glu Lys Ile Leu Lys Phe Glu
 180 185 190
 Gly Cys Tyr His Gly His Ala Asp Ser Phe Leu Val Lys Ala Gly Ser
 195 200 205
 Gly Val Ala Thr Leu Gly Leu Pro Asp Ser Pro Gly Val Pro Lys Gly
 210 215 220
 Ala Thr Ser Glu Thr Leu Thr Ala Pro Tyr Asn Asp Val Glu Ala Val
 225 230 235 240
 Lys Lys Leu Phe Glu Glu Asn Lys Gly Gln Ile Ala Ala Val Phe Leu
 245 250 255
 Glu Pro Val Val Gly Asn Ala Gly Phe Ile Pro Pro Gln Pro Gly Phe
 260 265 270
 Leu Asn Ala Leu Arg Asp Leu Thr Lys Gln Asp Gly Ala Leu Leu Val
 275 280 285
 Phe Asp Glu Val Met Thr Gly Phe Arg Leu Ala Tyr Gly Gly Ala Gln
 290 295 300
 Glu Tyr Phe Gly Ile Thr Pro Asp Val Ser Thr Leu Gly Lys Ile Ile
 305 310 315 320
 Gly Xaa Gly Leu Pro Val Gly Ala Tyr Gly Gly Arg Lys Asp Ile Met
 325 330 335
 Glu Met Val Ala Pro Ala Gly Pro Met Tyr Gln Ala Gly Thr Leu Ser
 340 345 350
 Gly Asn Pro Leu Ala Met Thr Ala Gly Ile His Thr Leu Lys Arg Leu
 355 360 365
 Met Glu Pro Gly Thr Tyr Asp Tyr Leu Asp Lys Ile Thr Gly Asp Leu
 370 375 380
 Val Arg Gly Val Leu Asp Ala Gly Ala Lys Thr Gly His Glu Met Cys
 385 390 395 400
 Gly Gly His Ile Arg Gly Met Phe Gly Phe Phe Phe Thr Ala Gly Pro
 405 410 415
 Val His Asn Phe Gly Asp Ala Lys Lys Ser Asp Thr Ala Lys Phe Gly
 420 425 430
 Arg Phe Tyr Arg Gly Met Leu Glu Glu Gly Val Tyr Leu Ala Pro Ser
 435 440 445
 Gln Phe Glu Ala Gly Phe Thr Ser Leu Ala His Thr Ser Gln Asp Ile
 450 455 460

Glu Lys Thr Val Glu Ala Ala Ala Lys Val Leu Arg Arg Ile
465 470 475

<210> 27
<211> 650
<212> DNA
<213> Triticum aestivum

<220>
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 ctccggcatc tcgatccgga cggtcgccgc tcctaagatc tcgcgcgcgc ctgcgtctcg 180

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gtcggtggtg aagggcggcc gtttccttag gcgagaaggc ttacacggtt caagaaatct 240
gaggagattt tcaacgctgc caaaggaatt tgatgcctgg aggtgttaat tcaaccaatc 300
cgtgccttca aaatcaatcc nggcgggaac ccanaatttt tgattccgtn aaaggntctc 360
anatgtngga ttccnatgga aatgaataat tgataagttt gntcctgggg cctgcancat 420
tggtcacgca aattacaang tgaagctgca ttattgaaan ccgnaanaag gaacnacttt 480
gggccaagtn cttgggaang ttttggnaaa atggcaactc gctgtccnan tacaaanggt 540
cctttgtaaa tcaagacaaa actgatggga gaatcgcctt ttcgtcatta ctggaaggaa 600
anntccaant taagggttca tgcangaaat ccttcnctta aaagaagggn 650

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<210> 28

<211> 67

<212> PRT

<213> *Triticum aestivum*

<400> 28

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Ile Arg Thr Val Ala Ala Pro Lys Ile Ser Arg Ala Pro Arg Ser Arg
                20                      25                      30

```

```

Ser Val Val Lys Gly Gly Arg Phe Leu Arg Arg Glu Gly Leu His Gly
                35                      40                      45

```

```

Ser Arg Asn Leu Arg Arg Phe Ser Thr Leu Pro Lys Glu Phe Asp Ala
                50                      55                      60

```

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Trp Arg Cys
  65

```

<210> 29

<211> 542

<212> PRT

<213> *soybean*

<400> 29

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Met Ala Val Ser Thr Ser Phe Pro Gly Ala Lys Leu Glu Ala Leu Leu
  1                      5                      10                      15

```

```

Leu Lys Cys Gly Ser Ser Asn Ala Ala Thr Ala Thr Ala Thr Thr Thr
                20                      25                      30

```

```

Thr His Leu Ser Cys Phe Cys Lys Thr Arg Lys Thr Leu Val Gln Ser
                35                      40                      45

```

```

Gln Arg Gly Pro Ile Arg Cys Glu Ala Ser Ser Ala Ser Asp Val Val
                50                      55                      60

```

```

Ala Asp Ala Thr Lys Lys Ala Ala Ser Val Ser Ala Leu Glu Gln Leu
  65                      70                      75                      80

```

```

Lys Thr Ser Ala Ala Asp Arg Tyr Thr Lys Glu Arg Ser Ser Val Met
                85                      90                      95

```

```

Val Ile Gly Leu Ser Val His Ser Thr Pro Val Glu Met Arg Glu Lys
                100                      105                      110

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Leu Ala Ile Pro Glu Ala Glu Trp Pro Arg Ala Ile Ala Glu Leu Cys
 115 120 125
 Ser Leu Asn His Ile Glu Glu Ala Ala Val Leu Ser Thr Cys Asn Arg
 130 135 140
 Met Glu Ile Tyr Val Val Ala Leu Ser Lys His Arg Gly Val Lys Glu
 145 150 155 160
 Val Thr Glu Trp Met Ser Lys Thr Ser Gly Ile Pro Val Ala Asp Leu
 165 170 175
 Cys Gln His Gln Phe Leu Leu Tyr Asn Lys Asp Ala Thr Gln His Leu
 180 185 190
 Phe Glu Val Ser Ala Gly Leu Asp Ser Leu Val Leu Gly Glu Gly Gln
 195 200 205
 Ile Leu Ala Gln Val Lys Gln Val Val Lys Val Gly Gln Gly Val Asn
 210 215 220
 Gly Phe Gly Arg Asn Ile Ser Gly Leu Phe Lys His Ala Ile Thr Val
 225 230 235 240
 Gly Lys Arg Val Arg Thr Glu Thr Asn Ile Ala Ala Gly Ala Val Ser
 245 250 255
 Val Ser Ser Ala Ala Val Glu Leu Ala Leu Met Lys Leu Pro Glu Ala
 260 265 270
 Ser His Ala Asn Ala Arg Met Leu Val Ile Gly Ala Gly Lys Met Gly
 275 280 285
 Lys Leu Val Ile Lys His Leu Val Ala Lys Gly Cys Thr Lys Met Val
 290 295 300
 Val Val Asn Arg Ser Glu Glu Arg Val Ala Ala Ile Arg Glu Glu Ile
 305 310 315 320
 Lys Asp Val Glu Ile Ile Tyr Lys Pro Leu Ser Glu Met Leu Thr Cys
 325 330 335
 Ile Gly Glu Ala Asp Val Val Phe Thr Ser Thr Ala Ser Glu Asn Pro
 340 345 350
 Leu Phe Leu Lys Asp Asp Val Lys Glu Leu Pro Pro Ala Thr Asp Glu
 355 360 365
 Val Gly Gly Arg Arg Leu Phe Val Asp Ile Ser Val Pro Arg Asn Val
 370 375 380
 Gly Ser Cys Leu Ser Asp Leu Glu Ser Val Arg Val Tyr Asn Val Asp
 385 390 395 400
 Asp Leu Lys Glu Val Val Ala Ala Asn Lys Glu Asp Arg Leu Arg Lys
 405 410 415
 Ala Met Glu Ala Gln Ala Ile Ile Gly Glu Glu Ser Lys Gln Phe Glu
 420 425 430

Ala Trp Arg Asp Ser Leu Glu Thr Val Pro Thr Ile Lys Lys Leu Arg
 435 440 445
 Ala Tyr Ala Glu Arg Ile Arg Leu Ala Glu Leu Glu Lys Cys Leu Gly
 450 455 460
 Lys Met Gly Asp Asp Ile Asn Lys Lys Thr Gln Arg Ala Val Asp Asp
 465 470 475 480
 Leu Ser Arg Gly Ile Val Asn Lys Leu Leu His Gly Pro Met Gln His
 485 490 495
 Leu Arg Cys Asp Gly Ser Asp Ser Arg Thr Leu Ser Glu Thr Leu Glu
 500 505 510
 Asn Met His Ala Leu Asn Arg Met Phe Asn Leu Glu Thr Glu Ile Ser
 515 520 525
 Val Leu Glu Gln Lys Ile Arg Ala Lys Val Glu Gln Lys Pro
 530 535 540

 <210> 30
 <211> 469
 <212> PRT
 <213> [Hordeum vulgare]

 <400> 30
 Met Ala Gly Ala Ala Ala Val Ala Ser Gly Ile Ser Ile Arg Pro
 1 5 10 15
 Val Ala Ala Pro Lys Ile Ser Arg Ala Pro Arg Ser Arg Ser Val Val
 20 25 30
 Arg Ala Ala Val Ser Ile Asp Glu Lys Ala Tyr Thr Val Gln Lys Ser
 35 40 45
 Glu Glu Ile Phe Asn Ala Ala Lys Glu Leu Met Pro Gly Gly Val Asn
 50 55 60
 Ser Pro Val Arg Ala Phe Lys Ser Val Gly Gly Gln Pro Ile Val Phe
 65 70 75 80
 Asp Ser Val Lys Gly Ser His Met Trp Asp Val Asp Gly Asn Glu Tyr
 85 90 95
 Ile Asp Tyr Val Gly Ser Trp Gly Pro Ala Ile Ile Gly His Ala Asp
 100 105 110
 Asp Lys Val Asn Ala Ala Leu Ile Glu Thr Leu Lys Lys Gly Thr Ser
 115 120 125
 Phe Gly Ala Pro Cys Ala Leu Glu Asn Val Leu Ala Gln Met Val Ile
 130 135 140
 Ser Ala Val Pro Ser Ile Glu Met Val Arg Phe Val Asn Ser Gly Thr
 145 150 155 160
 Glu Ala Cys Met Gly Ala Leu Arg Leu Val Arg Ala Phe Thr Gly Arg
 165 170 175

Glu Lys Ile Leu Lys Phe Glu Gly Cys Tyr His Gly His Ala Asp Ser
 180 185 190
 Phe Leu Val Lys Ala Gly Ser Gly Val Ala Thr Leu Gly Leu Pro Asp
 195 200 205
 Ser Pro Gly Val Pro Lys Gly Ala Thr Val Gly Thr Leu Thr Ala Pro
 210 215 220
 Tyr Asn Asp Ala Asp Ala Val Lys Lys Leu Phe Glu Asp Asn Lys Gly
 225 230 235 240
 Glu Ile Ala Ala Val Phe Leu Glu Pro Val Val Gly Asn Ala Gly Phe
 245 250 255
 Ile Pro Pro Gln Pro Ala Phe Leu Asn Ala Leu Arg Glu Val Thr Lys
 260 265 270
 Gln Asp Gly Ala Leu Leu Val Phe Asp Glu Val Met Thr Gly Phe Arg
 275 280 285
 Leu Ala Tyr Gly Gly Ala Gln Glu Tyr Phe Gly Ile Thr Pro Asp Val
 290 295 300
 Thr Thr Leu Gly Lys Ile Ile Gly Gly Gly Leu Pro Val Gly Ala Tyr
 305 310 315 320
 Gly Gly Arg Lys Asp Ile Met Glu Met Val Ala Pro Ala Gly Pro Met
 325 330 335
 Tyr Gln Ala Gly Thr Leu Ser Gly Asn Pro Leu Ala Met Thr Ala Gly
 340 345 350
 Ile His Thr Leu Lys Arg Leu Met Glu Pro Gly Thr Tyr Glu Tyr Leu
 355 360 365
 Asp Lys Val Thr Gly Glu Leu Val Arg Gly Ile Leu Asp Val Gly Ala
 370 375 380
 Lys Thr Gly His Glu Met Cys Gly Gly His Ile Arg Gly Met Phe Gly
 385 390 395 400
 Phe Phe Phe Ala Gly Gly Pro Val His Asn Phe Asp Asp Ala Lys Lys
 405 410 415
 Ser Asp Thr Ala Lys Phe Gly Arg Phe His Arg Gly Met Leu Gly Glu
 420 425 430
 Gly Val Tyr Leu Ala Pro Ser Gln Phe Glu Ala Gly Phe Thr Ser Leu
 435 440 445
 Ala His Thr Thr Gln Asp Ile Glu Lys Thr Val Glu Ala Ala Glu Lys
 450 455 460
 Val Leu Arg Trp Ile
 465